HLA Object Model Development Process and Supporting Tools

Integrated Training Program

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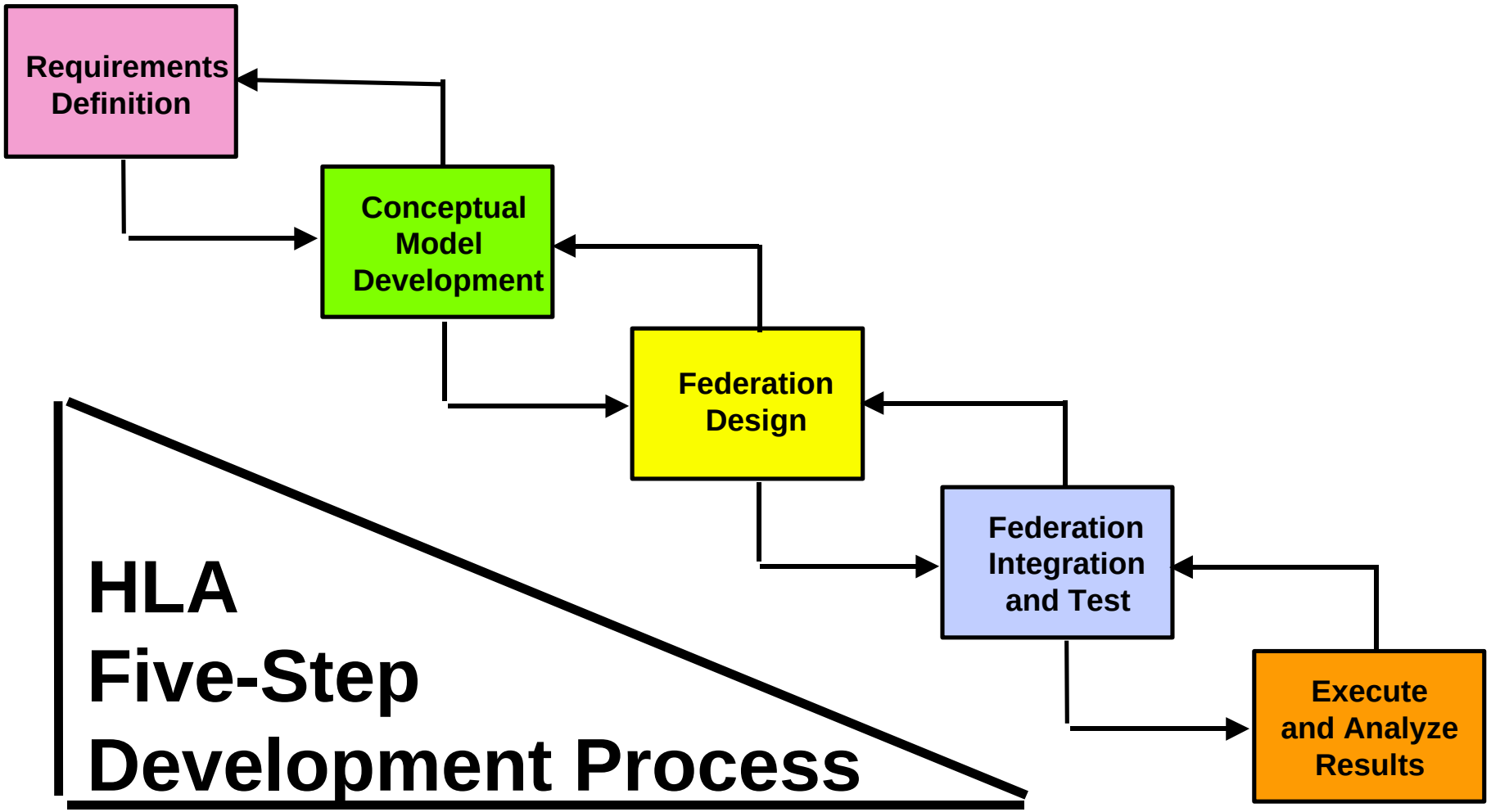
Purpose

- **To describe a process view for HLA object development, highlighting alternative object model development strategies**
- **To describe and demonstrate an integrated suite of tools to support the HLA object model development process**

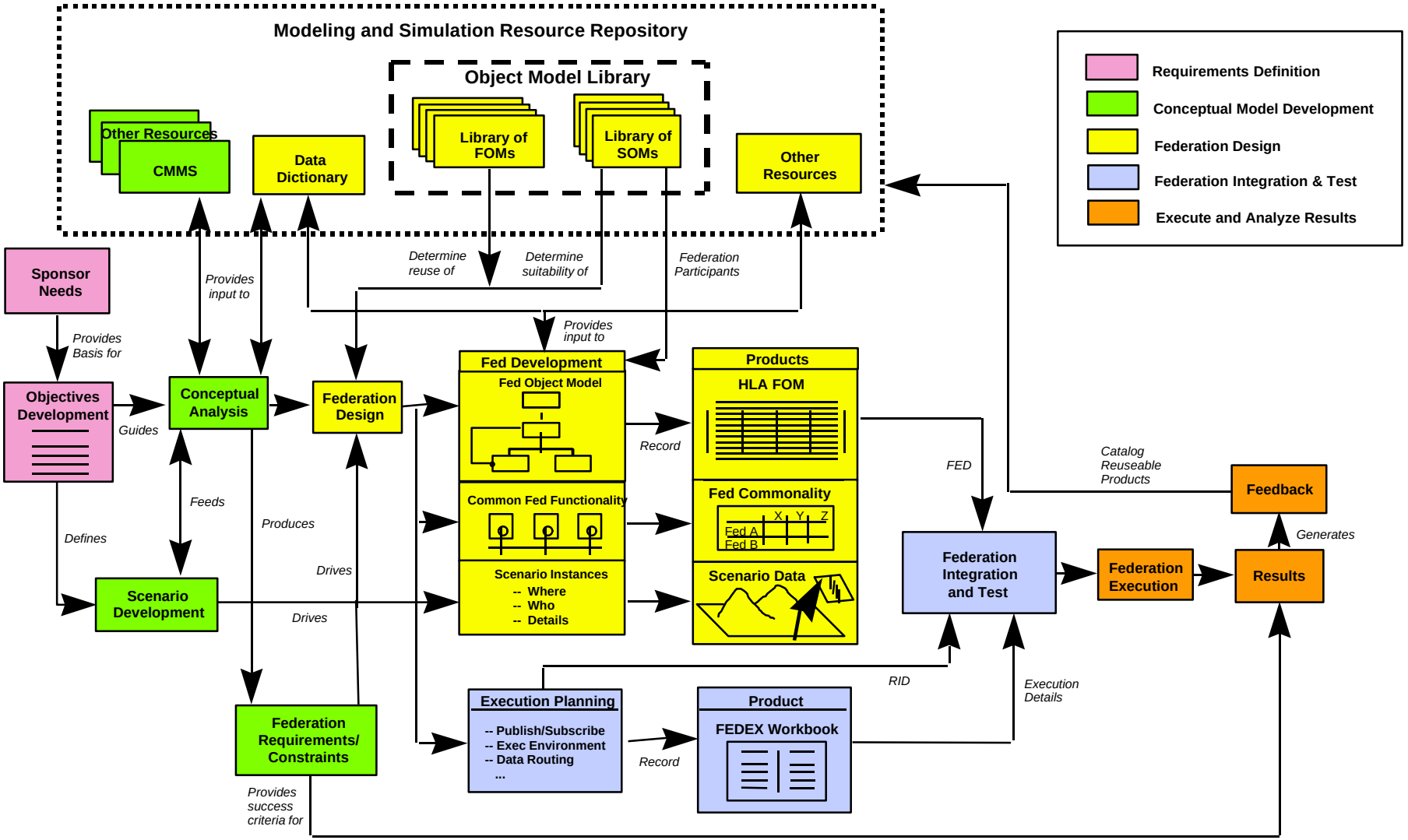
Introduction

- **Feedback from HLA protofederations emphasized need for process descriptions for HLA federation and object model development**
- **HLA Federation Development and Execution Process (FEDEP) model developed through cooperative effort between HLA protofederations and HLA TST Core**
- **Sharing of OM development concepts among HLA protofederations (via the OMT Working Group) provided the foundation of the HLA Object Model Development Process**
- **HLA protofederation feedback also emphasized need for automated tools to support development processes**
  - **Led to development of the HLA Tool Architecture**

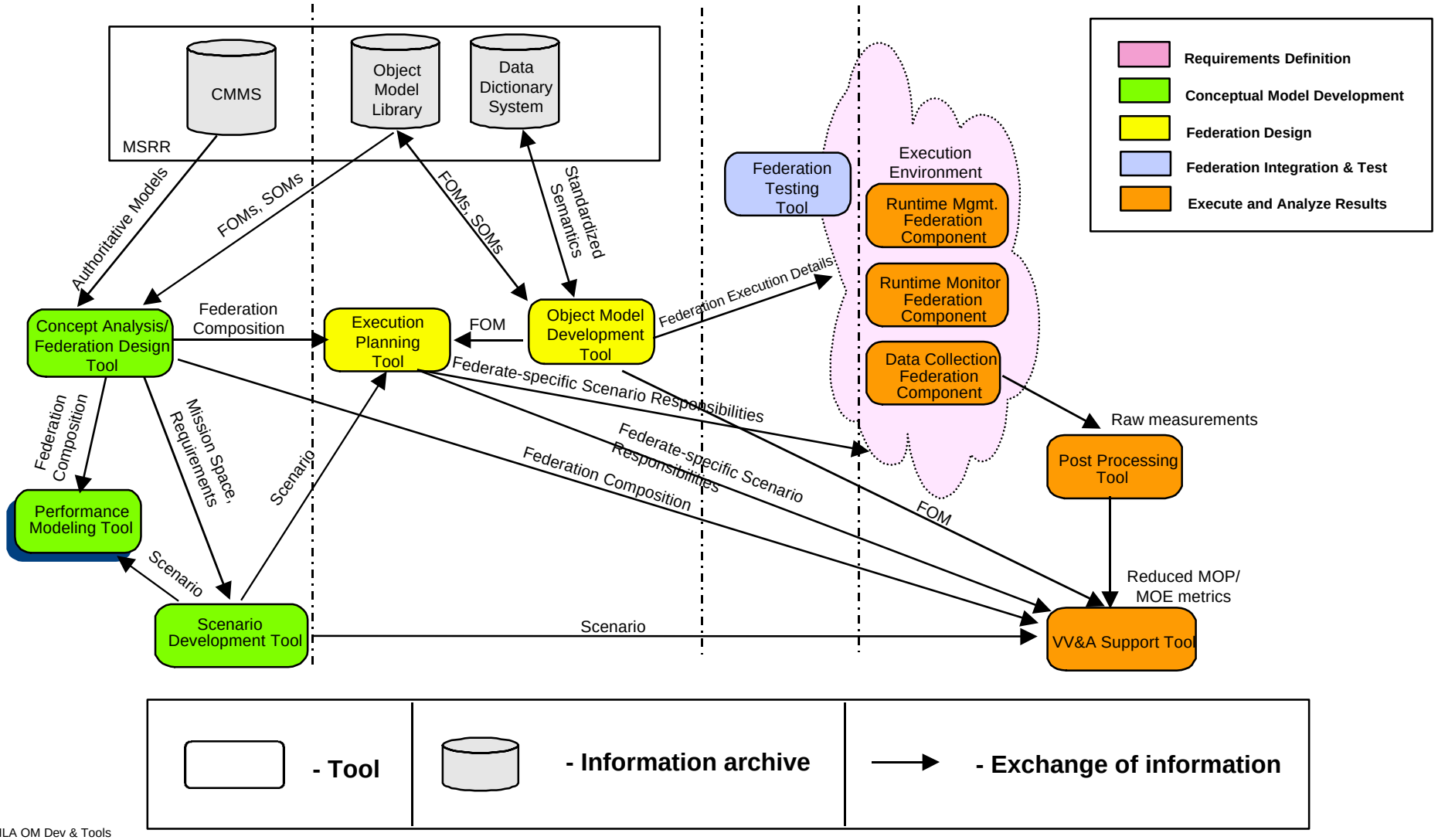
HLA FEDEP Model



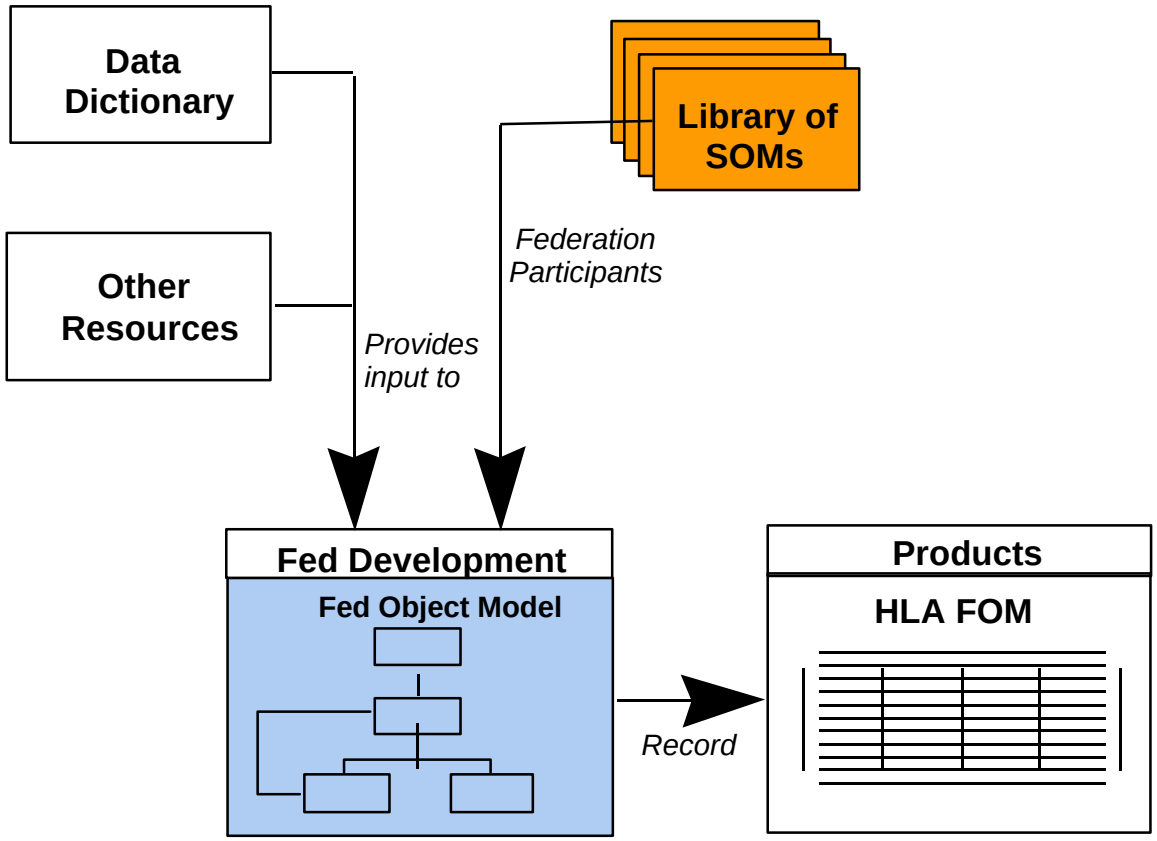
HLA FEDEP Model



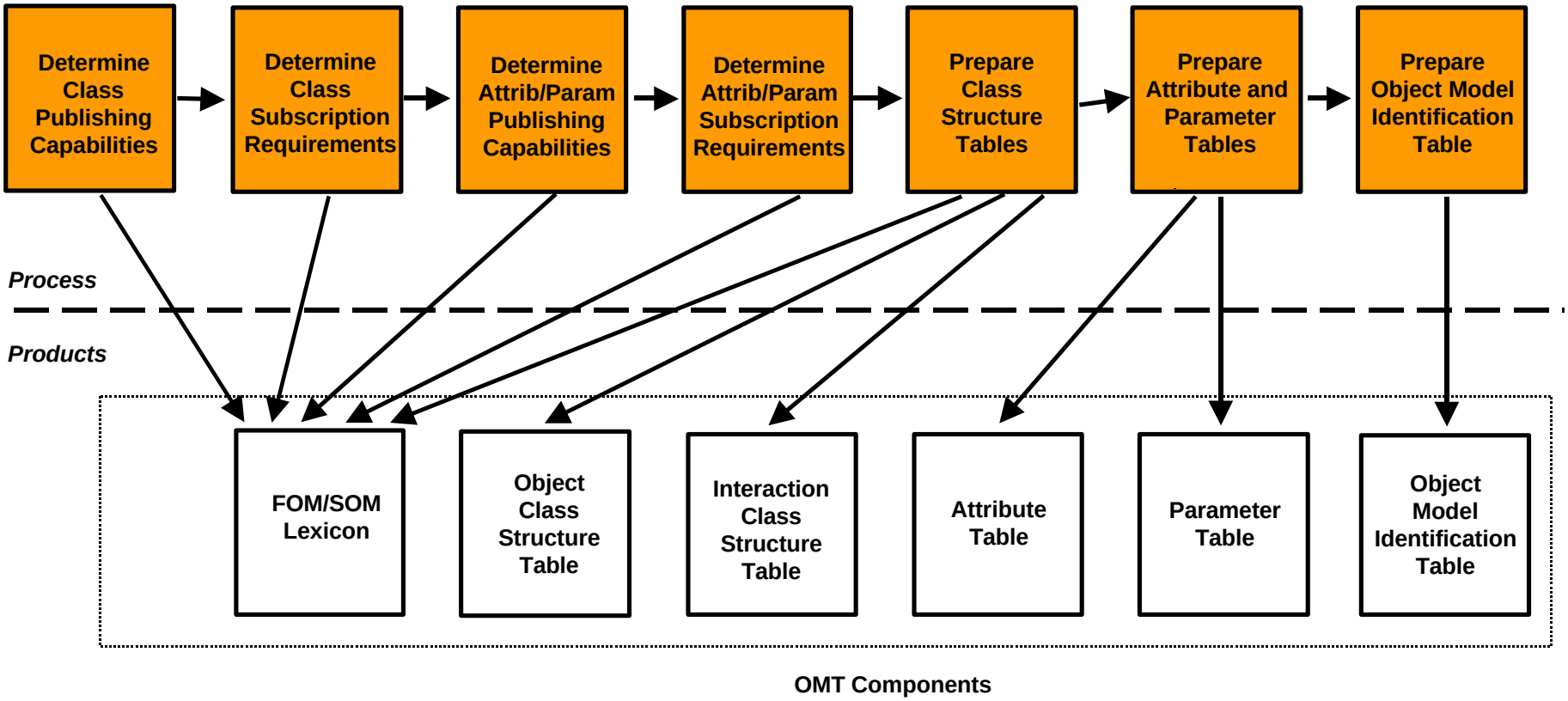
HLA Tool Architecture



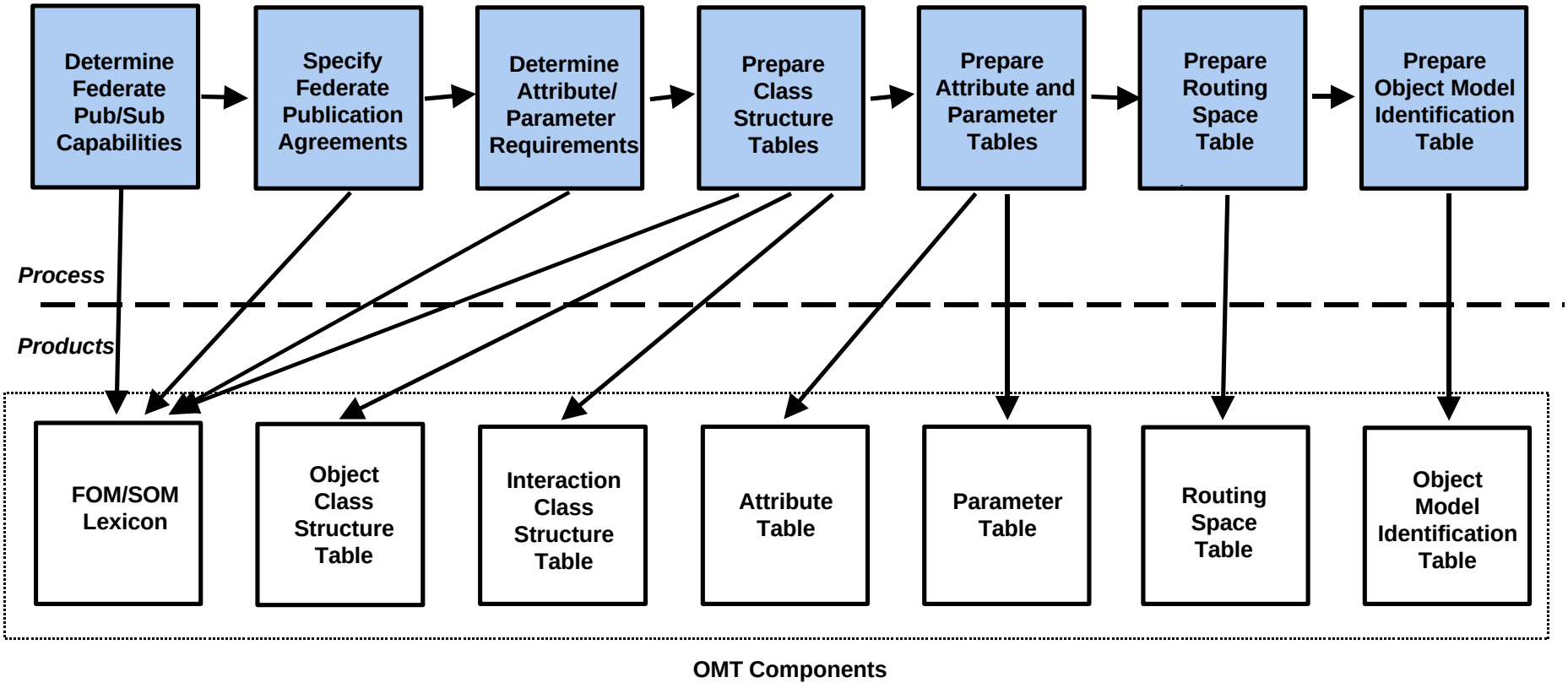
OM Development



SOM Development Process



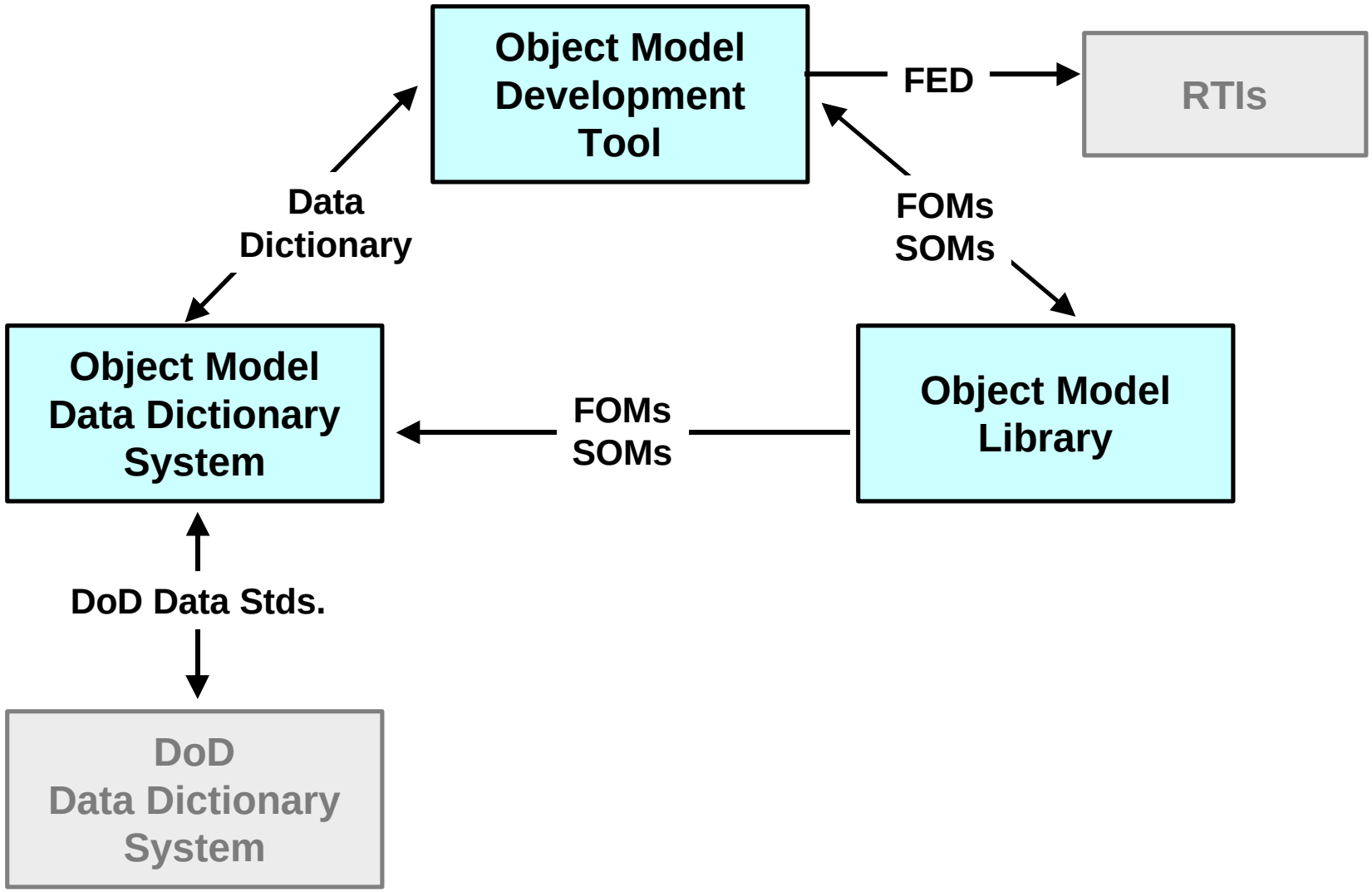
FOM Development Process



HLA Object Model Tools

- **DMSO is providing an initial, integrated suite of tools to support the development, management, and use of HLA object models and Object Model Data Dictionary (OMDD) contents:**
  - **Object Model Development Tool (OMDT)**
    - **Editor for the creation and modification of FOMs and SOMs**
  - **Object Model Library (OML)**
    - **A central repository to support the sharing and reuse of FOMs and SOMs**
  - **Object Model Data Dictionary System (OMDDS)**
    - **A central repository of OMDD contents for use in creating FOMs and SOMs**

HLA Object Model Integrated Tools Suite



OML Purpose

- **Provide a central library to support the reuse of FOMs and SOMs**
- **Support the Federation Execution Development Process (FEDEP)**
  - **Provide access to persistent and "reference" FOMs and SOMs**
  - **Provide existing FOMs and SOMs as design examples**
  - **Support the creation of new FOMs and SOMs from pieces and parts of existing FOMs and SOMs**
  - **Provide a basis for the evaluation of existing federates as possible federation members by the examination of their SOMs**
- **Provide developers and sponsors with a means of advertising their federate/federation capabilities**

OML Design

- **WWW-based application**
  - **Compatible with any frames-capable Web browser**
  - **Tested with Netscape 3.0 and Internet Explorer 3.0**
- **Centralized database supports object model storage, searching, and browsing**
- **Provides OM interchange using a standard OMT Data Interchange Format (DIF)**
- **Supports integration with other OM tools through a public call interface for checking models into and out of the library**
- **Extensive online documentation**
  - **Step by step user procedures**
  - **OMT DIF specification**
  - **Call interface description**
- **Online support through email**

OML Features

- **Searching**
  - **Across FOMs/SOMs**
  - **Within names and the associated lexicon**
- **Browsing within an individual FOM or SOM**
  - **Web pages corresponding to the OMT tables (routing space table, object classes, attributes, etc.)**
  - **Hyperlinks to full OM details**
  - **Hyperlinks between OMT components**
- **Check new FOMs/SOMs into the library**
- **Add/edit additional OM metadata to fully describe a FOM/SOM**
- **Check a copy of a FOM/SOM out of the library**
- **Registration of FOM/SOM owners (required to check in models)**

OMDDS Purpose

- **Provide access to an Object Model Data Dictionary of standards-based contents for the construction of FOMs and SOMs**
- **Shorten the time to develop FOMs and SOMs using an OMDT through reuse of names, lexicons, data representations, and enumerations**
- **Improve the understandability and reusability of FOMs and SOMs through the use of common names, lexicons, data representations, and enumerations**
- **Support the development of new data standards and modification of existing data standards based to meet M&S needs**

OMDDS Design

- **WWW-based application**
  - **Compatible with any Java Script-capable Web browser**
  - **Tested with Netscape 4.0 and Internet Explorer 4.0**
- **Centralized OMDD database supports OMDD contents storage, searching, and browsing**
- **Provides OMDD interchange using a standard OMDD DIF**
- **Extensive online documentation**
  - **Step by step user procedures**
  - **OMDD DIF specification**
- **Online support through email**

OMDDS Features

- **Searching**
  - **Within categories of OMDD contents (object classes, interaction classes, etc.)**
  - **With a selectable context (names, definitions, associated terms, etc.)**
- **Browsing within categories of OMDD contents**
- **Viewing links between OMDD contents and**
  - **FOMs and SOMs in the OML**
  - **Defense Data Dictionary System contents**
- **Managing a user's selection of OMDD contents across multiple Web sessions**
- **Exporting a user's selected OMDD contents for OMDT use**
- **Registration of OMDD users (required to maintain a persistent list of OMDD export selections)**

OMDD Content Development

- **Initial OMDD contents were developed in conjunction with three target programs:**
  - **Real-time Platform Reference (RPR) FOM**
  - **Engineering Federation FOM**
  - **Joint Training Confederation (JTC) FOM**
- **OMDD contents use names, definitions, data representations and enumerations from authoritative sources**
  - **Defense Data Dictionary System**
  - **Conceptual Models of the Mission Space Libraries**
  - **Joint Pub 1-02, IEEE Handbooks, and other authoritative sources**
- **Over time, the OMDD scope will be broadened to serve a larger sector of the M&S community**

OMDD Contents

- **Object Classes**
  - Names, definitions, notes, sources, and associated terms
- **Interaction Classes**
  - Names, definitions, notes, sources, and associated terms
- **Generic elements (basis for attributes and parameters)**
  - Names, definitions, notes, sources, and associated terms
  - Data type and units of measure (multiple representations)
- **Complex data types**
  - Names, fields, sources, and associated generic elements
- **Enumerated data types**
  - Names, enumerators, representations, notes, sources, and enumerator synonyms

OMDT Purpose

- **Reduce manpower associated with FOM/SOM development**
- **Provide means of producing HLA object models in open OMT Data Interchange Format (DIF)**
- **Provide integrated access to supporting resources/data (OM Library, OMDDS)**
- **Automate production of Federation Execution Data (FED)**
- **Maintain lowest possible learning curve**
  - **Intuitive user-interface**
  - **Help system and documentation**

OMDT Design

- **Windows 95/Windows NT application**
- **Developed in Visual C++ using the Microsoft Foundation Classes**
- **User Interface designed around HLA OMT tabular views**
  - **Supports in-place editing within OMT-defined tables**
  - **Optional editing interface in Win95-style property sheets**
- **Architecture based on “Model/View” design pattern**
  - **Internal data model independent of user interface view(s)**
  - **Single internal representation for data enforces “consistency during build” across the different views**
- **Multiple Document Interface allows opening multiple object models simultaneously**

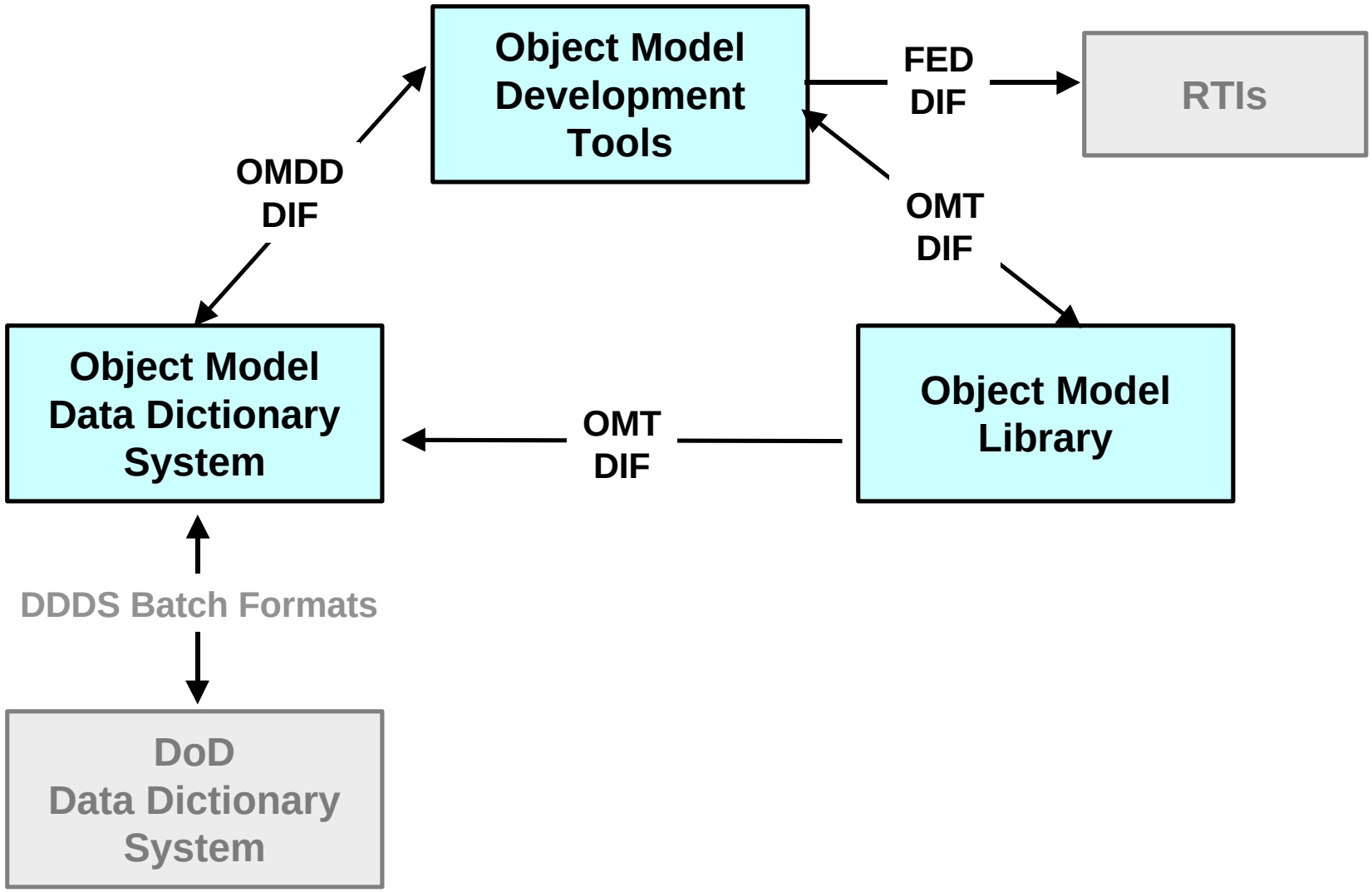
OMDT Features

- Reads and writes Federation Execution Data (FED) file
- CDIF interface to COTS OO CASE tools
- Built-in access to OM Library
- Support for Object Model Data Dictionary
  - Imports OMDD DIF
  - Context-sensitive access to imported OMDD data
- Consistency checker validates OMT-defined rules for HLA models
- “Smart” copy/paste maintains object model relationships
  - Attributes copy with classes, parameters copy with interactions
  - Inheritance relations among classes on clipboard preserved
  - Supports copy/paste between object models
- User’s Guide and Reference Manual integrated in Windows Help

Data Interchange Formats

- **A DIF is a specification of the semantics and structure of data to be interchanged between multiple data producers and multiple data consumers**
- **HLA DIFs are Backus Naur Form (BNF) descriptions of delimited ASCII text**
- **HLA DIFs support the interchange of object model information among HLA tools**
- **HLA DIFs provide an open specification for development of new object model tools which will integrate with the existing tool set**

HLA DIFs


Object Model Development Tools
FED DIF
RTIs
OMDD DIF
OMT DIF
Object Model Data Dictionary System
OMT DIF
Object Model Library
DDDS Batch Formats
DoD Data Dictionary System

OM Tool Access

Integrated Training Program

- OMDT
  - Register through HLA Software Distribution Center (http://hla.dmso.mil)
- OML and OMDDS
  - Linked from the HLA web page
  - Select Federation Development Process and Tools
  - Follow the links to the OML and OMDDS

Summary

- **Process models for HLA federation and object model development are continuing to evolve and mature**
  - **Basis for user guidance in OM and federation development**
- **Automated tools are critical throughout the HLA FEDEP to achieve usability and efficiency goals**
  - **Better use of simulation at lower cost**
- **HLA tool development is just beginning**
  - **Tool architecture and DIFs provide a framework for the development of GOTS, COTS, and contributed tools**